基于 RLS 的 Boost 转换器在线多参数辨识研究

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摘　要：为了消除电感和电容变化对 Boost 转换器控制性能的影响，提出了一种基于递推最小二乘法(recursive least squares method , RLS)的在线多参数辨识算法.首先介绍了 Boost 转换器在线多参数辨识系统，通过小幅度改变参考电压为电感和电容在线辨识提供必要的瞬态过程.然后分析了一个开关周期内 Boost 转换器的电感电压和电容电流特性，推导出精确的电感和电容辨识模型，进一步应用 RLS 算法，得到电感和电容的最优估计方法.最后对提出的多参数辨识算法进行了仿真验证.仿真结果表明，该算法可以在瞬态条件下，精确快速地估计电感和电容值，且具有良好的鲁棒性.

关键词：Boost 转换器；递推最小二乘法；参数辨识；数字控制

Study of RLS-Based Online Multiparameter Identification for Boost Converter

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Abstract: In order to eliminate the effect of inductance and capacitance variations on control performance of boost converter, this paper proposed a RLS based online multiparameter identification algorithm. Firstly, the online multiparameter identification system for boost converter was introduced. By changing the reference voltage with small amplitude, an essential transient for online identification of inductance and capacitance can be obtained. Then the characteristics of inductor voltage and capacitor current in a switching cycle were analyzed and a precise model for inductance and capacitance identification was deduced. Further, by applying RLS, an optimal method for inductance and capacitance estimation was derived. Finally, the validity of the proposed algorithm was demonstrated by simulation. The simulation results show that the algorithm can estimate the inductance and capacitance precisely and rapidly, and has good robustness.

Key words:Boost converter; recursive least squares method; parameter identification; digital control

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